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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/073,339	02/13/2002	Fumio Horiguchi	219538US2S	4599
22850	7590	06/10/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			TRAN, ANDREW Q	
			ART UNIT	PAPER NUMBER
			2824	

DATE MAILED: 06/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/073,339

Applicant(s)

HORIGUCHI, FUMIO

Examiner

Andrew Q. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) 9,21-53,55 and 56 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8,10-20 and 54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: <u>See Continuation Sheet</u> . |

Continuation of Attachment(s) 6). Other: Information Disclosure Statements of Feb 13, 2002; Apr 18, 2002; Aug 27, 2002; Sep 06, 2002; Sep 16, 2002; and Oct 02, 2002 (8 pages total).

DETAILED ACTION

Election/Restrictions

Applicant's election of Species A of Figs. 18 and 19, corresponding to claims 1-20 and 54, in the reply filed on March 31, 2005, is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 21-53 and 55-56 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on March 31, 2005. Claim 9 is further withdrawn from consideration for being readable on Species B of Figs. 32 and 33, but not readable on the elected species A of Figs. 18 and 19.

Title

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

--Multi-value magnetic random access memory with stacked tunnel magnetoresistance (TMR) elements--.

Specification

The disclosure is objected to because of the following informalities:

In the specification, at page 17, line 20, "DATA2" should be changed to --DATA1--. At page 30, line 22, --.-- (the period) should be added at the end of the line.

Appropriate correction is required.

Drawings

The drawings are objected to because :

In Figs. 18 and 30, lower left reference numeral 30 should be corrected. It currently points to bitline 23. In Fig. 37, the label "Sift Register" should be changed to --Shift Register--.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 1, 6-8, 10, 12-16, 18-20 and 54 are objected to because of the following informalities:

In claim 1, line 2, "TMR" (first occurrence) should be spelled out; for example, --tunnel magnetoresistive (TMR)--. In claim 1, line 3, --on-- should be inserted after "stacked". In claim 6, line 4, --in-- should be added before "contact". In claim 8, line 3, --in-- should be added before "contact"; and on line 5, "direct" should be changed to --directly--. In claim 10, line 4, "to" should be changed to --in the--. In claim 12, line 6, --in-- should be inserted after "written". In claim 13, line 4, --from-- should be added after "separated". In claim 14, line 3, --the-- should be added before "asteroid"; on line 4, --from-- should be added after "different"; and on line 5, --in-- should be added after "written". In claim 15, lines 5 and 7, "to" should be changed to --for--. In claim 16, lines 4 and 5, "at" should be changed to --in--. In claim 18, line 5, "detects" should be changed to --is detected--. In claim 19, line 4, "out" should be deleted. In claim 20, line 4, "a" (first occurrence) should be changed to --the--; and "generated" should be changed to --generates--. In claim 54, line 3, "latched" should be changed to --latches--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-8, 10-20 and 54 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is incomplete as failing to recite the interconnections between claimed elements, e.g. "a TMR element" (line 2) and "first and second current driving lines" (line 4). It is suggested to use terms such as --coupled to-- to recite said interconnections. Further in claim 1, line 2, the term "a TMR element" is indefinite because it is unclear what is being recited. As understood

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from the disclosure, this element appears to read on the “stacked TMR structure 31” of Figs. 19 and 9, or Figs. 19 and 10. Nevertheless Applicant’s clarification is required. The same comment about indefiniteness applied to “first and second TMR layers” (claim 1, line 2). It is suggested to change this recitation to --first and second TMR elements--, as disclosed in the instant specification. Moreover, the phrase “to both of said first and second TMR layers individually” (claim 1, lines 5-6) is not clearly understood. What is meant by “both” and “individually” at the same time ? In claim 17, line 3, “said insulating layer” lacks proper antecedent basis.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-8, 10-20 and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhu (US Pat. 5,930,164 hereafter “Zhu”). See Figures 1-6 and relevant descriptions.

As to claim 1, Zhu teaches a magnetic random access memory comprising a TMR element (Zhu’s MRAM unit 10 in Fig. 1, or MRAM unit 31 in Fig. 3) having first and second TMR layers (first and second memory cell 11 and 12 in Fig. 1, or memory cell 34 and 35 in Fig. 3) stacked on each other; and first and second current driving lines (word line W2 and digit line D1 in Fig. 3) that intersect each other. As to claim 2, Zhu further teaches a source line (common terminal 40 in Fig. 3); and a switching element (gate transistor 37) connected between the TMR element and the source line. As to claim 3, see Fig. 1 and col. 1, ln. 31-33. As to claim 4, Zhu further teaches a nonmagnetic conductive layer (electrically conductive layer 13 in Fig. 1) being

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sandwiched between the first and second TMR layers. As to claim 5, it would be inherent from Zhu's teaching to provide an antiferromagnetic layer between the first and second memory cells 11 and 12 in Fig. 1. As to claim 6, note that the claimed "a bit line" (claim 6, line 3-4) corresponds to word line W2 in Fig. 3 of Zhu (see col. 5, ln. 30-34 where word line W2 is activated for "reading"). As to claim 7, see Fig. 3 where word line W2 and digit line D1 are at a right angle to each other. As to claim 8, further note that it would be inherent, in Zhu's Fig. 3, to lay digit line D1 under MRAM unit 31. As to claim 10, Fig. 3 shows that digit line D1 and common line 40 overlap each other and extend in the same direction. As to claim 11, Zhu stores data in the first and second memory cell 11 and 12 through free magnetic layers 112 and 122, respectively. As to claim 12, see Fig. 6 and col. 5, ln. 41-67 bridging to col. 6, ln. 1-6. As to claim 13, see separate first memory cell 11 and second memory cell 12 in Fig. 1. As to claim 14, see col. 2, ln. 58-60. As to claim 15, see Figs. 4 and 6. As to claim 16, in Fig. 3, a sense current flows from word line W2 through MRAM unit 31 and gate transistor 37 to a ground or common terminal 40, i.e. uni-directional (col. 5, ln. 32-34), while a write current I flows in digit line D1 in both direction $+I$ or $-I$, i.e. bi-directional. As to claim 17, see col. 1, ln. 66-67 bridging to col. 2, ln. 1-2. As to claims 18 and 19, the "detecting resistance" would be inherent from Zhu's teachings. As to claim 20, see current source 14 in Fig. 1. As to claim 54, see col. 5, ln. 26-28.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nagai (US Pat. 6,445,613) describes a magnetic random access memory.

Ito (US Pat. 6,504,752) describes a magnetic random access memory.

Hosotani (US Pat. 6,670,660) describes a semiconductor memory device utilizing tunnel magneto resistive effects and method for manufacturing the same.

Iwata et al. (US Pat. 6,724,653) describes a magnetic random access memory.

Iwata et al. (US Pat. 6,795,334) describes a magnetic random access memory.

Iwata (US Pat. 6,804,144) describes a magnetic random access memory.

Iwata et al. (US Pat. 6,839,269) describes a magnetic random access memory.

Schuster-Woldan et al. (US Pub. 2001/0035545) describes an MRAM memory.

Hosotani et al. (US Pub. 2002/0141233) describes a semiconductor memory device including memory cell portion and peripheral circuit portion.

Iwata (US Pub. 2003/0123271) describes a magnetic random access memory.

Iwata (US Pub. 2003/0198080) describes a magnetic random access memory.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Q. Tran whose telephone number is (571) 272-1885. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Andrew Q. Tran
Primary Examiner
Art Unit 2824

at
June 08, 2005